

Percent Area Visual Obscuration of F1 Racecar Canopies

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Abstract

Considering human product interactions early and often in the engineering design process may improve product quality, facilitate user safety, reduce time to market, decrease or eliminate the need for costly physical prototypes, and reduce expensive late stage design changes. Currently, F1 race cars do not include a cockpit canopy to protect the driver from impact with foreign objects while racing which has caused serious driver injury and death in the past. However, such canopies may create obstructions in the F1 driver's front field of view. Driver visual obstructions may affect driving performance such as lap times by obscuring areas of the driver's visual focus. For example, the apex of turns and the front center chassis horizon are common F1 driver visual focus points that may be obscured by a cockpit canopy. This research uses Jack Digital Human Modeling (DHM) software to rank F1 racing car canopy concepts. Current results conclude that design concepts can be quantitatively ranked early in the design process using the suggested image analysis percent area visual obscuration methodology. Primary research results include; CAD models of a McLaren MP4-29 F1 Car, Bell F1 driver helmet, F1 HANS device, ImageJ macro for automated visual obscuration data collection, and percent area visual obscuration values for considered canopy variants.

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